

REMARKS

Status of the Claims

Claims 49-68 are pending in the application, and stand rejected.

No claims are amended at this time. All outstanding grounds for rejections were addressed by the previous office action response; the Applicants greatly appreciate withdrawal of those rejections.

A new rejection for alleged obviousness is the sole remaining basis for rejection.

Rejection Under 35 U.S.C. § 103

Claims 49-54, 56, and 59-64 were rejected as allegedly obvious based on a primary reference, Parton (US 5,653,859) in view of Hofmann (US 4,911,806).

According to the Examiner, Parton teaches an array of electrodes arranged in two parallel rows for moving particles using “traveling wave field migration (abstract).” The particles can comprise a ligand attached to a magnetic particle, and can be concentrated. “Parton et al. fail to specifically teach that the electrode would be an electromagnetic unit that would also act as a locus.”

However, the Examiner alleges that Hoffmann teaches “modification of electrodes with a coil, and applying electric signals to the electrodes and coil to generate electric and magnetic fields...Therefore it would have been obvious to modify the electrodes of Parton et al. by including coils, and to apply electric signals to the electrodes and coil to generate electric and magnetic fields, so that particles having different polarization and relaxation frequencies and sizes would migrate at different velocities and thereby sort into various fractions, allowing for better control over the magnetic particles in a fluid sample or solution.”

The Applicants traverse this rejection.

The combination of references is improper because it would change the principle of operation of the references.

A combination or modification of references cannot establish an obviousness rejection if the combination or modification changes the principle of operation of the cited reference. MPEP 2143.01(VI) (“If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959)”)

The instant rejection proposes a modification of Parton’s device. However, Parton’s device operates to move particles around solely by use of the ‘traveling wave field migration’ effect, as suggested by the Examiner. Parton states that this TWFM effect is another name for “traveling wave dielectrophoresis.” Col. 1, lines 9-12. It further lays out the theoretical and practical criteria for establishing TWFM. The criteria do NOT require a magnetic particle, and they do NOT rely upon magnetic forces to move a particle. It is well known that an electric field will be accompanied by a magnetic field, but the device in Parton uses the electric forces to move particles around.

In order to manipulate particles like cells from among a population of particles, Parton selectively modifies the particles so their TWFM, or dielectrophoretic, response to a field is changed. It does this in a variety of ways, including attaching a particle to colloidal gold, etc. See Col. 3, lines 18-60. It apparently uses a magnetic particle for this purpose, but repeatedly describes use of its methods to move cells and other non-magnetic particles like plastic microbeads, see col. 3, lines 13-16. Indeed, the purpose and principle of Parton’s device may be summed up by the first sentence of its abstract: “Particles are subjected to traveling wave field migration (TWFM) to migrate the particles over an array of microelectrodes.”

If modified to use a magnetic coil from Hoffmann, the operating principle of Parton would be radically changed. It would no longer be suitable for moving cells, etc. except ones that had been modified by linkage to a magnetic particle; and it would use an entirely different motive force to move particles around. It would no longer involve “Particles [are] subjected to traveling

wave field migration (TWFM)...” (See abstract.) Because the modification would entirely change the principle of operation of Parton’s device, it is NOT a proper basis for an obviousness rejection. Thus the rejection should be withdrawn.

In addition, Hoffmann, also appears to disclose only the use of dielectrophoretic forces to move particles: the particles in Hoffmann are not magnetic. *The magnetic coil in Hoffmann is not used to move particles*. It is used to manipulate an electric field, and the particles are moved around by dielectrophoreses, i.e., but the electric field. Modifying either reference so that a magnetic force is used to move a magnetic particle would introduce an entirely new principle of operation not contemplated by either reference’s device.

Hoffmann uses its magnetic field only to modulate the electric field it is using to manipulate cells and DNA molecules, etc. See its abstract, “By selecting the frequency, particles having different polarization relaxation frequencies and sizes will migrate at different velocities, and thereby sort into various fractions.” This seems to show that its manipulation is not dependent upon magnetic forces of the field, or on magnetic characteristics of the particles. Again, even if Hoffmann were used as a primary reference, modifying it to operate by the methods of the claim would radically change its principle of operation. Thus the rejection should be withdrawn.

The references do not provide a prima facie case for obviousness.

Parton uses only one magnetic coil. It does not describe micro-electromagnetic units at all; and it does not use its magnetic feature to move particles by changing the magnetic field distribution on a chip. Thus it does not disclose or suggest the limitations of claim 49, either alone or in combination with Hoffmann. Neither reference discloses or suggests moving magnetic particles by changing a magnetic field distribution. The claims require use of micromagnetic units “to change the magnetic field distribution of said electromagnetic chip, thereby altering magnetic forces acting on said magnetic microparticles. Neither reference alone, nor the combination together, discloses or suggests modifying a magnetic field distribution as a way to move a magnetic microparticle; thus the references do not provide a *prima facie* case for an obviousness rejection.

Indeed, it appears that the logical combination of Parton's dielectrophoresis system with Hoffmann's magnetic coil is not the invention as claimed; rather, it is essentially what Hoffman describes, a method to use a magnetic coil to modify the dielectrophoresis effects due to the interaction between the magnetic field and the electric one. Thus Hoffman's use of magnetic field appears to be just as a way to modulate the electric field that it utilizes to provide dielectrophoretic forces on particles.

The rejection as stated seems to discuss using dielectrophoretic properties to move particles. Thus it may be argued that the combination of references could be used for dielectrophoretic manipulations of magnetic particles. However, this fails to establish a *prima facie* case for a rejection, too, because the magnetic field's effect on a magnetic particle would be expected to interfere with any attempt to move particles by dielectrophoresis. The magnetic coil of Hoffmann is used only on nonmagnetic particles, apparently; it is not clear what would happen if it were used with magnetic particles. If the magnetic coil of Hoffmann were used along with the electrodes in Parton that provide dielectrophoretic (TWFM) forces to manipulate magnetic particles, one cannot tell what would happen to magnetic particles. The dielectrophoretic forces may be unable to control a particle that is magnetic in the presence of a magnetic field produced by the magnetic coil. Without a great deal more information, it would not be possible to tell what would happen to a magnetic particle, so the person of ordinary skill would certainly not be able to use the dielectrophoretic effects to manipulate magnetic particles, while also using a magnetic coil to modulate the electric / dielectrophoretic field. It seems likely that the coil would simply attract the magnetic particles to its surface! Thus if Hoffmann's coil were used along with Parton's electrodes, the person of ordinary skill would NOT have a reasonable expectation of success with using the device to manipulate magnetic particles via a dielectrophoretic force. And, of course, if the magnetic force were used, that would radically and improperly change the operating principle of Parton. Again, the references do not support an obviousness rejection.

The combination of references would render Parton unsuitable for its intended purpose.

In addition, Parton and Hoffman both rely upon dielectrophoretic forces, so they are capable of moving a wide variety of particles: neither reference requires a particle to be magnetic.

Modifying Parton to operate by the principles and steps of claim 49 would deprive Parton of its ability to manipulate particles such as cells and polystyrene beads, etc.: the product would only be able to move magnetic particles. One reason for that is discussed above: the magnetic field forces on a magnetic particle would interfere with dielectrophoretic forces, and it is not clear what would happen. And clearly if the device depended upon the magnetic forces for particle manipulation, it would not be suitable for manipulating most kinds of particles; it would be limited to use with magnetic particles, which appear to be entirely outside the scope of particles that Hoffmann is interested in. Thus the modification would defeat the purpose of Parton's (and also Hoffman's) device and render it unsuitable for its intended purpose, providing a method to move particles around based on their dielectrophoretic mobility differences. Such modification is impermissible when combining or modifying the teachings of a reference to support an obviousness rejection. MPEP 2143.01(V) ("If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984)"). For this additional reason, the rejection based on Parton in view of Hoffmann is improper and should be withdrawn.

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of the claims and to pass this application to issue. If it is determined that a telephone conference would expedite the prosecution of this application, the Examiner is invited to telephone the undersigned at the number given below.

In the event the U.S. Patent and Trademark office determines that an extension and/or other relief is required, applicant petitions for any required relief including extensions of time and authorizes the Commissioner to charge the cost of such petitions and/or other fees due in connection with the filing of this document to **Deposit Account No. 03-1952** referencing docket No. 471842001411. However, the Commissioner is not authorized to charge the cost of the issue fee to the Deposit Account.

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Respectfully submitted,

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